2.5 HUMAN-COMPUTER INTERFACE STANDARDS

2.5.1 Introduction

2.5.1.1 Purpose

This section provides a common framework for Human-Computer Interface (HCI) design and implementation in DoD automated systems. The objective is to standardize user interface design and implementation options thus enabling DoD applications within a given domain to appear and behave consistently. The standardization of HCI appearance and behavior within the DoD will result in higher productivity, shorter training time, and reduced development, operation, and support costs.

2.5.1.2 Scope

This section addresses the presentation and dialogue levels of the Human-Computer Interface. Section 2.2 addresses the application program interface (API) definitions and protocols. See Section 2.6.2.5 and Appendix A of the DoD HCI Style Guide, Security Presentation Guidelines, and other applicable portions of the DoD HCI Style Guide for HCI Security.

2.5.1.3 Background

The objective of system design is to ensure system reliability and effectiveness. To achieve this objective the human must be able to effectively interact with the system. Humans interact with automated systems using the HCI. The HCI includes the appearance and behavior of the interface, physical interaction devices, graphical interaction objects, and other human-computer interaction methods. A good HCI is both easy to use and appropriate to the operational environment. It exhibits a combination of user-oriented characteristics such as intuitive operation, ease and retention of learning, facilitation of user task performance, and consistency with user expectations.

The need to learn the appearance and behavior of different HCIs used by different applications and systems increases both the training burden and the probability of operator error. What is required are interfaces that exhibit a consistent appearance and behavior both within and across applications and systems.

2.5.2 Mandates

This subsection identifies the mandatory standards, profiles, and practices for human-computer interfaces. Each mandated standard or practice is clearly identified on a separate line, and includes a formal reference that can be included within Requests for Proposals (RFP) or Statements of Work (SOW). Appendix B contains a table that summarizes the mandated standards from this section, as well as providing information on how to obtain the standards.

2.5.2.1 General

The predominant types of HCIs include graphical user interfaces (GUIs) and character-based interfaces. For all DoD automated systems, the near-term goal is to convert character-based interfaces to GUIs. Although GUIs are the preferred user interface, some specialized devices may require use of character-based interfaces due to operational, technical, or physical constraints. These specialized interfaces shall be defined by domain-level style guides and further detailed in system-level user interface specifications. In order to present a consistent interface to the user, application software shall not mix command line user interfaces and GUIs.

2.5.2.1.1 Character-based Interfaces

The following is mandated for systems with an approved requirement for a character-based interface:

- DoD HCI Style Guide, TAFIM Version 3.0, Volume 8, 30 April 1996.

While not mandated, additional guidance for developing character-based interfaces can be found in ESD-TR-86-278, Guidelines for Designing User Interface Software (Smith and Mosier 1986).

2.5.2.1.2 Graphical User Interface

When developing DoD automated systems, the graphical user interface shall be based on one commercial user interface style guide consistent with Section 2.5.2.2.1. Hybrid GUIs that mix user interface styles (e.g., Motif with Microsoft Windows) shall not be created. A hybrid GUI is a GUI that is composed of toolkit components from more than one user interface style. When selecting commercial off-the-shelf (COTS)/government off-the-shelf (GOTS) applications for integration with developed DoD automated systems, maintaining consistency in the user interface style is highly recommended.

See Section 2.2.2.2.1.2 for mandated GUI standards.

2.5.2.2 Style Guides

An HCI style guide is a document that specifies design rules and guidelines for the look and behavior of the user interaction with a software application or a family of software applications. The goal of a style guide is to improve human performance and reduce training requirements by ensuring consistent and usable design of the HCI across software modules, applications, and systems. The style guide represents "what" user interfaces should do in terms of appearance and behavior, and can be used to derive HCI design specifications which define "how" the rules are implemented in the HCI application code.

Figure 2.5-1 illustrates the hierarchy of style guides that shall be followed to maintain consistency and good HCI design within the DoD. This hierarchy, when applied according to the process mandated in the DoD HCI Style Guide, provides a framework that supports iterative prototype-based HCI development. The process starts with top-level general guidance and uses prototyping activities to develop system-specific design rules.

The interface developer shall use the selected commercial GUI style guide, refinements provided in the DoD HCI Style Guide, and the appropriate domain-level style guide for specific style decisions, along with input of human factors specialists to create the system-specific HCI. The following paragraphs include specific guidance regarding the style guide hierarchy levels.

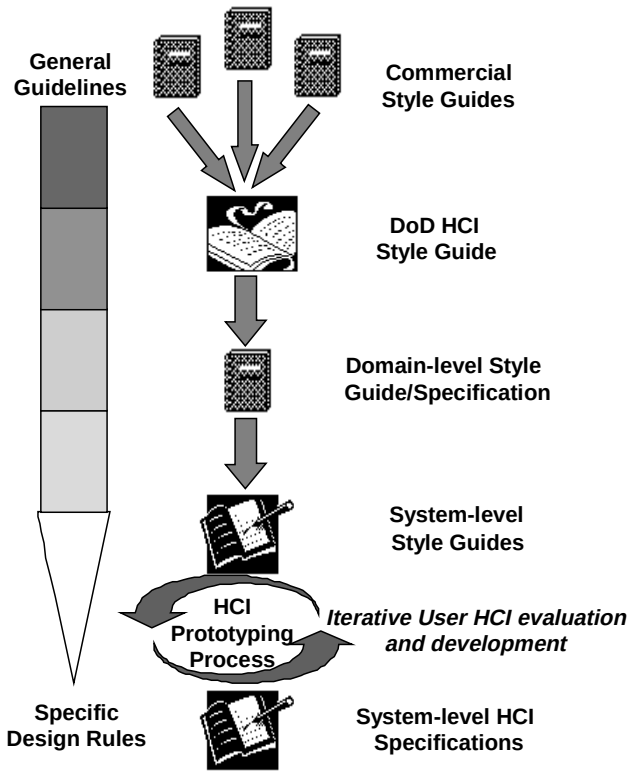

Figure 2.5-1 HCI Development Guidance

2.5.2.2.1 Commercial Style Guides

A commercial GUI style shall be selected as the basis for user interface development. The GUI style selected is usually driven by the mandates specified in Section 2.2 (User Interface Services and Operating System Services).

2.5.2.2.1.1 X-Window Style Guides

If an X-Windows based environment is selected, the style guide corresponding to the selected version of Motif is mandated:

- Open Software Foundation (OSF)/Motif Style Guide, Revision 1.2 (OSF 1992).

For systems required to interface with the Defense Information Infrastructure (DII) Common Operating Environment (COE), the following specification is mandated:

- TriTeal Enterprise Desktop (TED) 4.0 Style Guide and Certification Checklist, Carlsbad, CA: TriTeal Corporation, 1995.

2.5.2.2.1.2 Windows Style Guide

If a Windows based environment is selected, the following is mandated:

- "The Windows Interface Guidelines for Software Design", Microsoft Press, 1995.

2.5.2.2.2 DoD Human-Computer Interface (HCI) Style Guide

The DoD HCI Style Guide is a high level document which allows consistency across DoD systems without undue constraint on domain and system level implementation. The DoD HCI Style Guide (Volume 8 of the TAFIM Version 3.0) was developed as a guideline document presenting recommendations for good Human-Computer Interface design. This document focuses on Human-Computer behavior and concentrates on elements or functional areas that apply to DoD applications. These functional areas include such things

as security classification display, mapping display and manipulation, decision aids, and embedded training. This style guide, while emphasizing commercial GUIs, contains guidance that can be used for all types of systems including those which employ character-based interfaces. Although the DoD HCI Style Guide is not intended to be strictly a compliance document, it does represent DoD policy.

The following guideline is mandated:

- DoD HCI Style Guide, TAFIM Version 3.0, Volume 8, 30 April 1996.

The general principles given in this document apply to all interfaces; some specialized areas, however, require separate consideration. Specialized interfaces, such as those used in hand-held devices, have interface requirements that are beyond the scope of the DoD HCI Style Guide. These systems shall comply with their domain-level style guide and follow the general principles and HCI design guidelines presented in the DoD HCI Style Guide.

2.5.2.2.3 Domain-level Style Guides

The JTA allows for the development of domain-level HCI style guides. These style guides will reflect the consensus on HCI appearance and behavior for a particular domain within the DoD. The domain-level style guide will be the compliance document and may be supplemented by a system-level style guide.

The following domain-level style guide is mandated for Motif-based systems.

- User Interface Specification for the Defense Information Infrastructure (DII), Version 2.0, June 1996.

2.5.2.2.4 System-level Style Guides

System-level style guides provide the special tailoring of commercial, DoD, and domain-level style guides. These documents include explicit design guidance and rules for the system, while maintaining the appearance and behavior provided in the domain-level style guide. If needed, the Motif-based system-level style guide will be created in accordance with the User Interface Specification for the DII.

2.5.2.3 Symbology

The following standard is mandated for the display of common warfighting symbology:

- MIL-STD-2525A, Common Warfighting Symbology, 15 December 1996.

2.5.3 Emerging Standards

The standards listed in this subsection are expected to be elevated to mandatory status when implementations of the standards mature.

Motif 2.1 Style Guide is published as part of the CDE 2.1 documentation, and is expected to be mandated.

Most Web-based interfaces use Hypertext Markup Language (HTML) to describe the structure of the information they contain. The next version of the DoD HCI Style Guide and the User Interface Specifications for the DII are expected to address HTML-based interfaces. The next version of the User Interface Specification for the DII addresses Win32-based interfaces.

Currently, research is underway to investigate non-traditional user interfaces. Such interfaces may be gesture-based and may involve processing multiple input sources, such as voice and spatial monitors. Ongoing research and investigation includes the use of virtual reality and interface agents. Interface agents autonomously act on behalf of the user to perform various functions, thus allowing the user to focus on the control of the task domain. The DoD will integrate standards for non-traditional user interfaces as research matures and commercial standards are developed

Work to standardize data labeling for classified electronic and hardcopy documents is in progress. The results of this effort will replace the labeling standards currently appearing in Appendix A of the DoD HCI Style Guide, TAFIM, Version 3.0, Volume 8, 30 April 1996.